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EXECUTIVE SUMMARY

The Discussion Paper seeks views on the Government's overall strategy for reducing emissions of hazardous chemicals to the environment, particularly emissions from diffuse sources. It meets the commitment in the Second Year Report - *This Common Inheritance*, to consult on ways to control diffuse sources of the most dangerous chemicals and encourage their substitution with safer ones.

There are extensive controls on the discharge of chemicals from point sources such as factories, power stations or sewage treatment works, and many are subject to Integrated Pollution Controls operated by Her Majesty's Inspectorate of Pollution (or, in Scotland, Her Majesty's Industrial Pollution Inspectorate and the River Purification Authorities acting jointly). There are also controls on many diffuse sources such as vehicle exhaust emissions, or the agricultural use of sewage sludge. In the case of particular persistent chemicals such as heavy metals it is sometimes also necessary to introduce controls on marketing and use of products containing the substances to prevent release resulting from use or disposal of products.

The paper considers criteria for identifying chemicals which are likely to be of particular concern when released to the environment and sets out a procedure for assessing the risks to human health or the environment. It then considers ways of reducing emissions of such chemicals, especially emissions from diffuse sources. The paper identifies a hierarchy of possible measures, including voluntary agreements with industry, economic instruments and regulatory controls. Views are sought on the effectiveness and cost, and the advantages and disadvantages of each approach.

It is important that there is a consistent approach to the assessment and control of chemicals at both national and international level. The results of the consultation will be used to inform the development of Government policy on the control of chemicals released to the environment, particularly diffuse releases of chemicals which are persistent and may remain in the environment for a long time. This will in turn help to direct the UK contribution to European and international work on the assessment of chemicals in organisations such as OECD, The Paris Commission and CSD.

1. INTRODUCTION

Chemical substances which are persistent and resist degradation, or are non-degradable, can become widely distributed in the environment as a result of both point source and diffuse emissions. Some of these substances have a tendency to bioaccumulate in plants or animals, and little is known in many cases about the effects of long-term exposure. There is concern that long-term low-level exposure to certain chemicals could have adverse effects on human health or the environment.

1.1 Persistent substances in the environment

Chemical substances may be released to the environment during the manufacture, distribution, use or disposal of the substance itself, or following its incorporation into another product.[1] In general, releases of chemicals are divisible into two categories, point sources and diffuse sources. A point source can be defined as a discrete, identifiable location from which substances are discharged directly to the environment (e.g. a manufacturing plant, sewage works or power station). Under these circumstances emissions can be measured and controlled.

Diffuse emissions result from numerous and widely dispersed releases of substances to the environment and as a result may be difficult to contain or control. There may be many small, individual sources of such emissions, or widespread release over a large area. Diffuse emissions also arise from the indirect release of chemicals to the environment by evaporation, diffusion, leaching or other fugitive emissions.

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[1] *The word substance is used in the discussion paper to mean an element or a chemical compound either alone or incorporated into a product with other substances.*

Once in the environment chemical substances may be transported in air or water, or they may be temporarily or permanently immobilised in soil, sediments or ice. There may also be interchange of chemicals between environmental media due to evaporation, wash-out by rain or adsorption onto solid particles.

All but the most persistent substances are likely to undergo some chemical change in the environment and most organic chemicals are eventually degraded, either biologically or chemically, into simpler substances. Persistent chemicals can, however be circulated in the environment for long periods before eventually being degraded or immobilised. In some cases persistent or toxic substances may be formed in the environment by reaction or degradation of other chemicals. Living organisms may be exposed to chemicals in the environment either directly or via the food chain and can accumulate certain substances in their tissues. Long term monitoring of soils at a "semi-rural" location in the UK has identified increasing concentrations of certain persistent substances which has occurred since the mid 1800's. For example the accumulation of cadmium at these sites is calculated to be between 0.7 and 1.9 ìg/kg/year, equivalent to an increase of 1.9 - 5.4 g Cd/hectare/year whilst the average net rates of increase of dioxins was calculated as 1.9 mg/hectare/year.

1.2 Emission controls

There have been controls on point and diffuse source emissions to air and water, and on waste disposal, for many years. These controls were extended and tightened by the Environmental Protection Act 1990 and through the introduction of the principle of integrated pollution control (IPC) for the most potentially polluting or technologically complex processes. Annex I of this paper describes current controls on point and diffuse source emissions to the environment and Annex IV describes IPC and the system of Local Authority Air Pollution Control. Current controls are mainly concerned with emissions of substances as wastes from industrial processes and other activities. In some cases they are supplemented by controls on the marketing and use of a substance or product containing it, to reduce emissions during use. Section 140 of the Environmental Protection Act 1990 gave the Secretary of State increased powers to control the import, use, supply and storage of hazardous substances, and requires him to consult the Advisory Committee on Hazardous Substances before doing so.

For some persistent potentially hazardous substances such as lead, cadmium and mercury the Government has already established a clear policy to reduce the exposure of Man and the environment and to prevent any increase in current environmental levels wherever practicable.

1.3 International agreements

There are a number of international agreements aimed at reducing emissions of specific chemicals which become widely distributed in the environment, such as the Montreal Protocol on substances which deplete the ozone layer (Annex II), and the Paris Convention for the Prevention of Marine Pollution (Annex III). The United Nations Conference on Environment and Development (The Earth Summit) in 1992 agreed as one of its objectives –

> *"to eliminate unacceptable or unreasonable risks and, to the extent economically feasible, to reduce risks posed by toxic chemicals, by employing a broad-based approach involving a wide range of risk-reduction options and by taking precautionary measures derived from a broad-based life-cycle analysis".*

Reducing emissions to the environment of chemicals which are toxic, persistent and bioaccumulative is an essential element of the strategy for sustainable development adopted at the Earth Summit.

The 5th European Community Action Programme on the Environment contains proposals for the control of chemicals which include data collection, hazard identification, risk assessment and risk management. The Programme also sets specific reduction targets for a number of substances including volatile organic compounds, dioxins and heavy metals. The proposals in this consultation paper would help to meet some of these targets.

At the Second North Sea Conference held in London in 1987 Ministers agreed to take measures to reduce inputs to the North Sea of substances that are persistent, toxic and liable to bioaccumulate. The agreed aim was to reduce inputs by 50% between 1985 and 1995. This agreement was confirmed at the Third North Sea Conference in 1990, which also agreed lists of substances covered, and increased the target reduction for lead, cadmium, mercury and dioxins to 70%. The Government has announced that it will apply these targets to all coastal waters, not just the North Sea.

1.4 Purpose of Consultation

The purpose of this discussion paper is to propose criteria for identifying chemical substances which are likely to be particularly dangerous because of their persistence or wide spread distribution in the environment, and to consider whether existing measures to control such emissions are adequate. The paper meets the commitment in the second year report "This Common Inheritance" to consult on ways to control diffuse sources of the most dangerous chemicals and encourage their substitution with safer ones.

It is mainly concerned with industrial, commercial and domestic chemicals which have the potential to harm human beings or other living organisms directly. It does not cover ozone depleting substances, genetically modified organisms or radioactive substances, which are regulated separately because of their specific effects on human health or the environment. Biologically active substances used as pharmaceuticals and pesticides are also regulated by the Medicines Act and FEPA, but some of these substances have other uses which are not covered by this legislation and may need to be controlled by general legislation on the use of chemicals.

The paper seeks views on the Government's overall strategy for reducing emissions of hazardous substances to the environment. The results of the consultation will assist the development of policy on hazardous substances generally, including the reduction of emissions to air, water and land from both point and diffuse sources. In particular, views are sought on the criteria for identifying chemicals of particular concern in Section 2, the procedure for assessing risks to human health and the environment in Section 3, and the advantages and disadvantages of the proposed hierarchy of control measures in Section 4.

There are many national and international organisations involved with the control of chemicals. Nationally DOE (including HMIP), NRA, HSE, MAFF, DH, SO, WO, NIO, HMIPI, local authorities and the RPA's, all have an interest in the control of chemicals, in some cases statutory responsibilities . Internationally, the European Union, OECD, The Paris Commission and several UN bodies have programmes on chemicals. It is important that these organisations should adopt consistent procedures for the selection and assessment of chemicals and the results of the consultation will help to achieve this.

2. IDENTIFYING CHEMICALS OF CONCERN

It is estimated that over 100,000 individual chemical substances have been produced in, or imported into, the European Community, and that around 10% of these are marketed in quantities of over 10 tonnes per year. This obviously leads to problems in identifying those substances which are most likely to cause an adverse environmental effect. There are three basic types of information that can be used to assess the risks associated with the use of a specific substance:

- data on its inherent properties, e.g. toxicity, potential to bioaccumulate, potential to degrade, environmental mobility, physicochemical properties, and,
- use related data, e.g. amount used, type of use, disposal routes, measured concentrations in environmental media and food.
- data on breakdown products, e.g. as a result of either degradation or metabolism, or on contaminants of the original substance.

Toxicity and bioaccumulation potential determine the potential of the substance to cause adverse effects if released to the environment; data on use, degradability and mobility are used to estimate the likely exposure of people and other organisms. The identification of potentially environmentally hazardous substances is generally based on a comparison of exposure and effects to characterise the risk.

2.1 Identification of environmentally hazardous substances

The identification of environmentally hazardous substances depends on the availability of a reasonable amount of information. In most OECD countries, manufacturers or importers are required to provide a basic data set on all new chemicals placed on the market for the first time. A number of national and international programmes to collect data sets for chemicals already on the market - existing chemicals - are now underway. Over the next few years the OECD High Production Volume chemical programme, and the EC Regulation (No. 793/93) on the evaluation and control of the risks of existing substances will provide dossiers on all high-tonnage substances manufactured or imported into the EC. However, information has been gathered for only a relatively small number of substances at present, although much is available in the scientific literature.

There are several lists of chemicals which are particularly hazardous to the environment, including List I and List II of EC Directive 76/464/EEC on discharges of dangerous substances to the aquatic environment, the UK Red List, and the lists of substances regulated by international agreements such as the Montreal Protocol and the Paris Convention for the Prevention of Marine Pollution. These agreements are described in more detail in Annexes II and III.

EC Directive 67/548/EEC on the classification, packaging and labelling of dangerous substances has recently been amended to include a classification, "Dangerous for the Environment", based on criteria specified in Directive 91/325/EEC and subsequent amendments. This provision of the Directive came into effect in September 1993 and data on several hundred substances have already been examined and classifications proposed in conformity with the criteria.

2.2 Criteria

In the case of high-tonnage chemicals which are released into the environment, the following properties would indicate a *prima facie* case for concern about potential adverse effects;

- chemicals which are persistent (i.e. non-degradable or which have very long half-lives of the order of years);
- chemicals which bioaccumulate, either in fatty tissues or in specific organs;
- chemicals which are known to be toxic, or are structurally related to known toxic chemicals;
- chemicals which cause serious health effects with no accepted exposure threshold (eg genotoxic carcinogens).

These properties must be combined with evidence of the exposure of environmental organisms, or of man via environmental routes, including;

- information on the quantity of the chemical produced and its release into the environment during manufacture, distribution, use or disposal;
- environmental monitoring data;
- measured residues in plants, animals or man.

When there is reason to expect adverse effects and/or significant exposure, it will be necessary to carry out an in-depth assessment of the risks presented by the substance.

2.3 Consultation

The UK is playing an active part in programmes to reduce emissions of hazardous chemicals to the environment at national, European and international level. Every effort will be made to ensure that these programmes are fully coordinated to make the best use of the information collected and the scarce expertise in chemical risk assessment. It is clearly important that the selection of chemicals for assessment and any subsequent control measures should be based on sound science, and that the risks and benefits are fully evaluated. There will need to be wide consultation as these programmes develop and it is intended that the Advisory Committee on Hazardous Substances, established under S.140 of EPA 1990, should be consulted on procedures and on individual substances.

3. RISK ASSESSMENT

The environmental risks of chemicals are evaluated by comparing measured or predicted environmental concentrations with concentrations which are likely to cause harmful effects to target organisms. An outline of a procedure for selecting priority substances and carrying out a risk assessment, developed by a UK Government-Industry Working Group is set out in Annex V. The full report of the Working Group is available from the Toxic Substances Division of DOE (Section 5). The procedure involves estimating environmental exposure to the substance, assessing possible effects on human health or environmental organisms, and estimating the probability of harmful effects occurring.

3.1 Estimating environmental exposure

Exposure of humans, animals and plants to substances in the environment occurs as a result of releases during manufacture, distribution, use and disposal of both the substance and products containing it, and the presence of naturally occurring background levels in some cases. Environmental releases from point sources can often be measured, but for diffuse sources this can be difficult. In each case, the magnitude of releases can usually be predicted by models derived from studies of specific industries and use patterns, and knowledge of production quantities.

Exposure of environmental organisms is modified by the behaviour of a substance after it is released. Its persistence and pathways in the environment may be predicted by abiotic and biotic degradation tests in the laboratory and modelling of its likely movement through the various phases of the environment including the food chain. In general the highest environmental exposures will be seen at the point of release, or near the greatest concentration of diffuse releases. However, in some cases persistent substances can be transported for long distances via environmental media and the food chain and may accumulate in parts of the environment remote from the original site of release. The assessment of environmental exposure is based on Predicted Environmental Concentrations (PECs) for a range of environmental media and locations or from measured concentrations. PECs are likely to be made up of both point and diffuse source components and can also be used to predict human exposure via environmental routes including the food chain.

3.2 Assessment of possible effects

Some effects can be predicted from laboratory toxicological tests. Basic mammalian and aquatic toxicity data are available for many substances, and some of their contaminants and degradation and combustion products. It is possible to estimate levels at which acute adverse effects to both man and other species may occur from these test results. Predicting long-term, or chronic, effects resulting from extended low-level exposure is more difficult, as relatively few substances have been thoroughly tested for these endpoints. Predicted No effect Concentrations (PNECs) for ecosystems are calculated by applying conservative assessment factors to the available toxicity data to extrapolate the laboratory data to the expected worst case real-life situation. A "No Observed Adverse Effect Level" (NOAEL) is generated in a similar manner for human health assessment. If there are no data on long-term environmental effects, then higher assessment factors are applied to the available data on short-term effects. For substances released into the environment in large quantities biological monitoring of actual effects can provide very useful information.

The ability of organisms to bioconcentrate a substance can be measured in the laboratory or predicted from physico-chemical properties. Bioconcentration is of concern because it can greatly magnify the amounts of a substance in plants and animals compared to the surrounding environment. While long-term toxicity studies should take account of the ability of an individual species to bioconcentrate a substance, there is still a possibility that the substance will bioaccumulate through the food chain, and the appropriate measurements should be used to assess the likelihood of this happening.

3.3 Combining exposure and effects

Comparing the predicted or measured concentration of a substance in the environment, or estimates of individual exposure, with the lowest concentration at which adverse effects are predicted gives an indication of whether problems can be expected. However both of these estimates are subject to uncertainty and it is not usually possible to make a decision on the need for control action on the basis of an initial assessment. Further information on exposure or effects is usually needed to refine the initial assessment and to estimate the probability of adverse effects actually occurring. If the estimated risk is high enough, or the consequences sufficiently serious, it will be necessary to apply the precautionary principle[2] and take action before there is unequivocal evidence of damage to human health or the environment.

The estimated risks can be compared with the economic and other benefits of using the chemical, which may include environmental or health benefits, in a life-cycle risk benefit analysis. The analysis should attempt to quantify as far as possible the risks to man and the environment arising from the manufacture, distribution, use and disposal of the substance, and to compare these with the economic or other benefits its use offers. It is also important to consider the availability of alternatives for essential uses, and any risks these may pose to man or the environment.

For some effects predicted by animal studies, such as genotoxic carcinogenicity, a safe level of exposure may not exist. Thus some EEC category 1 and 2 carcinogens, e.g. asbestos and 1.2-dichloroethane, may be considered for control action whatever their predicted exposure. The situation may also arise where, although the relationship between exposure and effects is unclear or the mechanism not fully understood, the potential long-term effect is so serious that precautionary action is needed, e.g. for lead, cadmium, and mercury. For substances such as these it is desirable to reduce environmental exposure wherever possible.

4. REDUCING EMISSIONS OF HAZARDOUS SUBSTANCES TO THE ENVIRONMENT

The legislation covering the emission of both point and diffuse source emissions of hazardous substances is described in detail in Annex I of this paper. Powers under Part I of the Environmental Protection Act 1990 are available to schedule any harmful substance emitted from a prescribed process. These point source controls are the primary means of controlling emissions of dangerous substances to the environment.

Some groups of chemicals released into the environment from diffuse sources, such as pesticides and pharmaceuticals, are already subject to strict legislative control and no further action is proposed in this discussion paper. However there are other substances, used mainly for industrial, commercial and domestic purposes which meet the criteria in Section 2 which are also released into the environment from diffuse sources. The number of such potentially harmful substances is likely to remain small, but because of their widespread use and economic or technological importance any additional controls on their use will need to be carefully justified.

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[2] *The term precautionary principle was defined in the Environment White Paper, "This Common Inheritance" (Cm1200) as:*

> *"Where there are significant risks of damage to the environment, the Government will be prepared to take precautionary action to limit the use of potentially dangerous materials or the spread of potentially dangerous pollutants, even where the scientific knowledge is not conclusive, if the balance of likely costs and benefits justifies it."*

The introduction of integrated pollution control will tighten controls on both point and diffuse source emissions from prescribed industrial processes (listed in Annex IV), but the same substance can be emitted by both prescribed and non-prescribed processes, and coordinated action will be required to reduce total emissions of persistent chemicals which are hazardous to the environment. There are a number of additional measures which could be taken to further reduce diffuse emissions of these substances.

The Government believes that regulatory control should be used only where other approaches, including economic instruments are not likely to be effective in reducing the risk of harm to the environment.

4.1 Voluntary agreements

Prohibition of an existing substance from the market can be very expensive; investment in its development, production and use will have been wasted. By the same token withdrawing a substance from the market after harm has been observed is clearly unsatisfactory and damage may well continue if the substance is persistent or bioaccumulative and the withdrawal programme prolonged. It is therefore likely to be in everyone's interest that harmful substances do not come onto the market in the first place.

The voluntary approach already operates to some extent to protect the environment from harmful substances. New chemicals are screened by manufacturers under the New Chemicals Notification scheme before they are placed on the market and development of new products may be halted if the estimated risk appears likely to be unacceptable.

Voluntary approaches have worked well for a number of products already on the market; for example UK manufacturers have agreed to remove lead driers from paints on a voluntary basis. Voluntary agreements avoid the need for regulation and give industry the maximum flexibility in deciding how to meet environmental objectives. Statutory enforcement is not required, but such agreements must be supported by reduction targets and timetables against which their performance can be judged.

Producers have the responsibility for implementing voluntary agreements, but the effectiveness of such agreements can be reduced where there are many producers and disparate markets. Experience from the control of CFC's in the UK suggests that voluntary approaches are most effective when action is taken on both means of production and consumption in parallel. Two new initiatives which have particular relevance to voluntary action are described below.

4.2 Chemicals release inventory

The Toxics Release Inventory (TRI) introduced by the US Environmental Protection Agency (EPA) is claimed to have resulted in large reductions in the total emission of certain toxic substances. The TRI requires companies above a certain size to submit annual figures for total emissions of specified toxic substances. The detailed figures are published by EPA and the information is made widely available to local and national interest groups. The Department of the Environment has recently published a consultation paper on the Government's proposals for an annual inventory of releases of substances which cause pollution of the environment from industrial processes subject to control by HMIP. A number of major chemical companies have already announced their intention to reduce total emissions of certain polluting substances on a voluntary basis, and further plans of this type are likely to be announced in future. The Scottish Office is also currently considering the need for an annual inventory of releases.

4.3 Ecolabelling and Eco-Management

The UK has played a leading role within the European Community in pressing for the introduction of two voluntary schemes - the Ecolabelling Scheme and the Eco-Management and Audit Scheme - both designed to give market advantage to participating companies. The Ecolabelling Scheme, which was launched on the 1 July 1993, will provide an official EC label for products which can meet stringent environmental criteria, demonstrating that they are less damaging to the environment than alternative brands when assessed over the whole of their life cycle. Criteria which are currently being developed for the award of the label to early product groups, including hairsprays and paints, are likely to set challenging standards on aspects such as emissions of volatile organic compounds and metals content.

Approval was recently given for the establishment of an Eco-management and Audit Scheme, which is designed to give Community recognition to industrial sites, which adopt effective environmental management systems aimed at continuous improvement in performance and report regularly on their progress to the public. The Government has also supported the development by BSI of the new Environmental Management Standard (BS7750). Both these initiatives should help to promote the introduction of managed programmes by industry to control and reduce emissions.

4.4 Economic instruments

If voluntary approaches are judged unlikely to succeed, more active intervention in the market may be necessary. The second year report on the White Paper - This Common Inheritance - sets out a new presumption in favour of economic instruments rather than regulation to deliver environmental goals.

Economic instruments have already been used through the leaded petrol tax differential to reduce the exposure of the general population to lead in air. The attraction of economic instruments is that they enable the market to allocate the substance to the more essential uses without the intervention of the regulator.

This allocation might be achieved by setting a tax on the substance at a level judged to bring about the desired reduction in total use. Alternatively, as with CFC's, the total production of the substance could be specified, but the market left to allocate the resource. Measures of this kind not only control the hazardous substance but also provide a market incentive to develop substitutes.

Economic measures can also be used to encourage increased recycling of suitable materials. It is not practical to recycle all chemicals, but in some cases, such as CFC's used as refrigerants and metallic lead, recycling is a practical option. An increase in the cost of the raw material, or a deposit which is repaid when used products are returned, are measures which would help both to increase the proportion of the material which is recycled, and reduce the amount entering the environment as waste. Future options for the application of economic instruments to increase the recycling of wastes have been reviewed in a study commissioned by the Department of the Environment. A report of the study has now been published. A further document published by the Department and titled 'Making Markets Work for the Environment', provides further explanation of the intentions behind the use of economic instruments and guidance on their application.

4.5 Controls on marketing and use

When the market structure makes it likely that neither voluntary control nor economic instruments are likely to deliver environmental goals, prohibiting sale or use may be the only option.

Substance-based controls are complementary to the more usual measures based on control of point source emissions to particular environmental media. They provide a means of limiting total emissions of persistent substances by restricting the amounts produced and used in the first place and stimulating the development of substitute materials. The priority should be to limit the most dispersive and least essential uses of a particular substance before deciding whether any further action is necessary.

In the case of the most hazardous substances with very few essential uses, banning certain uses may not be adequate and a positive listing of permitted uses may be more appropriate. Pesticides, for instance, can only be used when approved for specified purposes under the Control of Pesticides Regulation 1986. A number of industrial chemicals are also subject to a positive approval regime; PCBs and PCTs are regulated by EC Directive 76/769/EEC (the Marketing and Use Directive) which originally permitted certain limited uses, but these have now been revoked by an amendment to the Directive. The positive listing approach is an effective means of limiting emissions of persistent hazardous substances which become widely distributed in the environment. There are a number of other chemicals which could be considered for control by this means, including lead, cadmium and mercury and their compounds, and chrysotile asbestos.

However, regulation need not go as far in the first instance as the introduction of statutory controls on the use of a substance. One difficulty in assessing what action may be required is to know what are the present and future uses of a hazardous chemical. Section 142 of the Environmental Protection Act 1990 contains powers which could be used to require industry to notify the Department of the Environment of all existing uses of a substance and any planned new ones. The European Communities Regulation on the evaluation and control of the risks of existing substances provides similar powers for chemicals chosen for priority review. This form of notification has a number of advantages. It is less onerous than regulation. It would provide an early opportunity to evaluate the risk to human health or the environment generally from new uses. It signals ahead chemicals that may be subject to action so that industry can consider the case for substitutes and make the necessary changes to products or processes in good time. Notification of existing and proposed uses would also provide the information needed to design an effective voluntary scheme or economic instrument if appropriate.

5. ISSUES FOR DISCUSSION

This Discussion Paper points out that there are some persistent chemical substances which are emitted by many different sources over a long period of time and as a result become widely distributed at low concentrations throughout certain sectors of the environment. If these substances bioaccumulate or show signs of toxicity, there is cause for concern about possible harmful effects on human health or the environment. The criteria for identifying these substances are discussed in Section 2 of this paper; the properties of the substance itself (persistence bioaccumulation, toxicity) are the primary criteria, but the substance must also be produced and released in sufficient quantities to cause widespread environmental effects, and it should therefore be possible to detect its presence in the environment.

The establishment of criteria for identifying environmentally hazardous chemicals and assessing the risks of individual uses will provide a framework which will enable manufacturers and users of these substances to make long-term product development and investment decisions with a reasonable degree of certainty about future measures to protect human health and the environment.

> ***What criteria should be applied to identify substances falling into this category? Are the criteria referenced in Section 2 sufficiently transparent?***

When it is necessary to take measures to reduce both point and diffuse source emissions media-based emission controls may not be sufficient to control diffuse releases resulting from use and disposal of the substance, and it may be necessary to restrict or prohibit the use of the substance or products containing it by means of substance-based controls.

A small number of substances which cause very serious health effects, such as genotoxic carcinogens, may also need to be controlled in the same way in order to minimise or prevent human exposure and release to the environment.

Decisions to introduce stringent controls on the use of hazardous substances must be based on careful evaluation of all the risks and benefits over the whole life cycle of the substance. Whenever possible the risks and benefits of using the substance should be quantified and full account taken of the economic costs of the changeover to alternatives. It will also be necessary to consider the risks and benefits of the substitute products themselves, and any difference in their performance or efficacy compared with the product they replace.

> *Are the methods proposed adequate for the assessment of the risk of such chemicals?*

Four tiers of action have been proposed for the reduction of diffuse releases of hazardous chemicals. Voluntarily agreed targets and timetables on production and use of certain chemicals, economic instruments including ecolabelling and eco-management applied to the sale of certain chemicals, notification requirement for new and existing uses, and finally statutory controls on the marketing and use of specified substances. There will be advantages to industry in the early identification of potentially hazardous substances which may be subject to control action. Manufacturers will be able to plan the development of replacement products and to avoid the cost of introducing products which are subsequently restricted.

> *What are the advantages and disadvantages of these approaches? What can be learnt from the successful application of these approaches in the past to achieve environmental protection with the minimum administrative burden?*

Views are also sought on the need to reduce diffuse emissions to the environment of specific substances, including in particular the heavy metals lead, cadmium and mercury, and the best means of achieving this objective.

The market for chemicals is international and any additional control measures could have significant consequences for trade in the substances concerned, and for the operation of the European Community internal market. Any such measures would therefore have to be agreed at EC level, unless major needs relating to protection of the health and life of humans, animals or plants required urgent action at national level. For these reasons views will also be sought from the European Commission and international organisations concerned with the environmental effects of hazardous chemicals.

Comments and opinions on the issues in the consultation paper should be sent by 31st May 1994 to:

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ANNEX I

Point and Diffuse Source Emmissions of Hazardous Chemicals to the Environment and Existing Control Measures

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ANNEX I (Point and Diffuse Sources)

1. INDUSTRIAL SITES

1.1 SOURCES

There are many ways by which substances can be released during the operation of industrial processes. Such releases can be divided into three principal groups:

i) Industrial Processes

A significant proportion of emissions of substances arise from production and manufacturing processes located within industrial premises.

Substances that are consumed or produced in a process can be released to the atmosphere, discharged in a liquid effluent, incinerated or disposed of to landfill, all as an integral part of the process. These substances can be raw materials for the process (feedstock), intermediates, primary constituents of the product, by-products, or naturally occurring impurities. In addition chemical additives may be incorporated in the product to alter its final properties. If the feedstock is derived from recycled materials it may contain many impurities that were deliberate additives to the original material.

Most industrial operations seek to maximise the yield from raw materials including recycled constituents and in so doing minimise the amount of a substance going to the final waste discharge. During the manufacturing process most substances will either be incorporated in the end product or reused within the processing cycle. Any planned release of waste material will commonly arise as a point source. Many discharges from industry contain a mixture of several waste substances accumulated from numerous parts of the process and may include small concentrations of raw material contaminants not directly involved in the process.

The amount of any given chemical released to the environment from an industrial process may either be quantified by direct analytical measurement of all emissions or predicted through application of an appropriate mass balance equation. This latter method seeks to predict the quantities of various substances likely to arise in the waste emission through knowledge of the quantities of material inputs to a particular process and their concentration in finished products or recycled constituents. The mass balance approach is not a fully precise method and fugitive emissions from point sources may escape attention during monitoring.

ii) Use of Products

Many chemical products are used in industry that are incidental to the composition of the end product, e.g. process solvents, degreasers, biocides, lubricants and detergents. Use of these products may also lead to an emission during the production process. In some cases the chemical is designed to be released intentionally over a set period of time (lubricant) or at a specific stage in the production cycle (reaction product, solvent or coolant). Some of these releases will be collected and either recycled or discharged to the environment under controlled conditions. For other releases collection is either impractical or uneconomic, notably when the emission is regarded to be of such a diffuse nature to not constitute a hazard in the workplace. However in these instances the releases may accumulate to potentially hazardous levels elsewhere in the environment and therefore diffuse emissions should be considered in this light.

iii) Spillages, Leaks and Accidents

Small scale spillages and leaks are a possibility in even the most carefully controlled processes.

They may comprise large, one-off discharges of substances to the environment or smaller but more frequent leaks e.g. vapour emissions from valves, or dust emissions from external storage facilities. In some cases of spillages or leaks, other substances used specifically for clean-up or containment purposes may themselves constitute additional releases. Larger unplanned releases from more serious accidents can result in locally high levels of contamination. Incidences of explosions and fires, can lead to major releases of substances to air, land or water, the dispersion of which may be encouraged by the escape of water used in the fire-fighting operations. In these cases long-term local contamination of soils, surface-waters and groundwater may occur, and also shorter term non-local exposure from chemically charged airborne or waterborne plumes moving downwind or downstream of the incident. Accidents result in point releases, but spillages and leaks may occasionally be so endemic as to be regarded as diffuse sources of pollution.

1.2 CONTROLS

Emissions from a large number of point sources are controlled either through the operation of Integrated Pollution Control (IPC) or the Local Authority Air Pollution Control System (LAAPC) (see Annex IV), under Part I of the Environmental Protection Act 1990. Under this legislation prescribed processes (see Annex IV) require authorisation entailing implementation of measures to control waste emissions. Control measures are linked to the operating principle of BATNEEC (Best Available Techniques Not Entailing Excessive Cost) and as such are made as effective as the technology will allow. In the case of established industries such as power generation, metal production and processing and the production of bulk chemicals this means that minimisation of emission levels is guided by the current state of available technology. Both control regimes (IPC, LAAPC) are concerned to tackle contained and fugitive releases from prescribed processes.

Under the Water Resources Act 1991 all discharges (including those from Sewage Treatment Works) to receiving waters are consented by the National Rivers Authority or in the case of Scotland the River Purification Authorities . The NRA, RPA, set conditions in consents which are designed to achieve environmental quality standards (EQSs) set in the Surface Waters (Dangerous Substances) (Classification) Regulations 1989 and 1992 for specific substances, which in turn enforce the environmental quality objectives (EQOs) set in the EC Directives.

Under the Water Industry Act 1991 all discharges of trade effluent to sewer are consented by sewerage undertakers.

Under Part I of the Environmental Protection Act 1990, and the arrangements for integrated pollution control (IPC), operators of prescribed processes must apply for authorization from Her Majesty's Inspectorate of Pollution (HMIP). The Act requires traders to use BATNEEC to prevent the release of prescribed substances, or where that is not practicable, to reduce their release and render them harmless. For discharges to water the prescribed substances equate broadly to the Red List, and IPC will play a major part in reducing inputs of these substances to the aquatic environment.

Waste material destined for landfill is controlled by local authorities who determine the licensing of local waste disposal facilities.

Internationally agreed initiatives to reduce levels of hazardous substances in the environment are a driving mechanism for the instigation of national control measures towards various emissions. Notable examples are the numerous Recommendations and Decisions agreed under the Paris Convention for the Prevention of Marine Pollution (see Annex III), the initiatives regarding ozone depleting chemicals established under the Montreal Protocol (see Annex II), the target reductions for emissions of specified substances to the North Sea expressed in the Ministerial Declarations of the 2nd and 3rd North Sea Conferences, and the UNECE Protocol on the control of emissions of volatile organic compounds (VOCs). The Government has recently published a consultation paper on the proposed establishment of a Toxic Release Inventory, similar to the one already operating in the USA. The TRI requires companies above a certain size to submit annual figures for total emissions of specified substances which are then widely published. The US Environmental Protection Agency claim that this activity has resulted in significant reductions in the total emissions of certain toxic substances.

Exposure to hazardous chemicals related to work activities is controlled under legislation implemented and enforced by the Health and Safety Executive. Procedures and criteria for the monitoring, assessment and control of occupational exposure are defined under the framework legislation of the Control of Substances Hazardous to Health Regulations 1988. Further instruction to prospective users regarding the safe handling and disposal of hazardous substances is provided by way of labelling of chemical containers and the provision of safety data sheets. Criteria for these provisions are defined under the Chemicals (Hazard Information and Packaging) Regulations 1993 (CHIP).

Where controls at the point of use or disposal of hazardous substances are deemed to lack sufficient efficacy relative to the risk of harm to the user or the environment, regulations restricting the supply and use of the substance can introduce a greater element of control. The Marketing and Use Directive (76/769/EEC) and its amendments are the principle mechanism for the introduction of such controls at the European Community level, with subsequent implementation through national legislation. (see Section 2.2 for further discussion)

The risk of damage to the environment from spillages and major accidents involving hazardous substances will always be present. However the level of risk can be reduced through observance of relevant health and safety regulations, and specified criteria for safe operation of installations as laid out in the Control of Industrial Major Accidents Hazards Regulations (CIMAH) and in published guidance to these regulations. These Regulations require the implementation of measures to reduce the risk of major accidents and the formulation of forward plans by operators to cope with accidents and emergencies and their subsequent impact, and include consideration of protection of the environment. The establishment and operation of facilities concerned with the storage and use of substances which could, in quantities at or above specified limits, present major fire, explosion or toxic hazards to people in the vicinity requires hazardous substances consent from local authorities as set out in the Planning (Hazardous Substances) Act 1990. Consent will follow the establishment of planning controls and operating conditions to minimise risk.

2. RETAIL, COMMERCIAL AND DOMESTIC SITES AND PUBLIC BUILDINGS

2.1 SOURCES

i) Use of products

Many products commonly used in businesses, homes, domestic gardens or public premises may generate releases of hazardous substances to the environment. Some products essential for cleaning, disinfecting or drying, for colouring, printing or dyeing and for pest control or medicinal benefit are used and disposed of in a manner which would be readily identified as a diffuse source. Many of the cleaning products are water-based and are discharged to sewer or directly to the environment after use. In some cases the operational use of a product involves a direct release of chemicals to the environment. For example, solvents used in paints and glues are released rapidly to the atmosphere as the product dries, whilst biocides, such as those used in wood preservation or the algacides used in cooling systems, may be released over longer time periods. Chemicals used in the treatment of public water supplies of necessity consistently reach large numbers of people in very small concentrations. Other chemical performance based products may be disposed of, at the end of their period of use, but remain in a soluble form. As such they are often not easily retained or recovered at sewage treatment plants or recycling units and may ultimately be released to the environment.

Other products may not be used specifically as chemical agents but may lead to releases of hazardous chemicals during or after their use as an incidental occurrence. Plastics and paints, used in many domestic and commercial products, contain additives, some of which may be hazardous and can be leached out during the lifetime of the product or released when finally disposed of at landfill sites or incinerators. Fires, bonfires and domestic heating all lead to releases of chemicals found in the fuels, including small quantities of heavy metals and combustion products such as dioxins and furans.

Chemicals from many products are released diffusely to waste streams which end up at sewage treatment plants (STP), landfills or incinerators. Examples include: detergents and other cleaning fluids, paints, solvents and oils discharged via household drains, clinical waste from hospitals and dental surgeries, batteries, fluorescent tubes, thermometers, ink cartridges, chemical containers and other packaging materials disposed of in waste-bins, medicines not absorbed by the body, or waste oils collected from garages. While the STP, landfill or incinerator may be regarded as a point source of environmental releases (see Section 4.1), it must be remembered that a significant proportion of its input comes from the diffuse use of substances used in products.

ii) Spillages, Leaks and Accidents

Spillages, leaks and accidents leading to environmental release of substances can occur just as readily in commercial, retail and domestic premises as in industry. The only difference is that they tend to be smaller in scale, but occur more widely. Thus they tend to be even more diffuse than similar industrial releases. When products are damaged, for example mercury thermometers, liquid or powder containers, storage tanks and fuel pipes, substances may be inadvertently released to the environment.

2.2 CONTROLS

For effluent discharges current practices dictate that the owner or occupier of any premises is entitled to have their drains or private sewer communicate with the local sewerage system providing that the effluent does not arise from the operation of trade or industry or the substance is not one which is expressly prohibited. For discharges of trade effluent to sewers, consent of the sewerage undertaker must be obtained. This consent operates in a similar manner to that described in Section 1.2, and will involve the establishment of conditions of discharge built upon the potential effect of the effluent in the environment. This potential effect is measured against recommended informal water quality objectives drawn from EC directives on pollution caused by certain dangerous substances discharged into the aquatic environment and implemented in the UK principally by way of The Surface Waters (Dangerous Substances) (Classification) Regulations 1989 (see Section 1.2).

The Government has recently published a consultation paper setting out a proposed strategy for river quality, including its proposals for introducing statutory water quality objectives. Activities corresponding to achievement of water quality improvements required under EC legislation are frequently reviewed and member states have to submit progress reports on the status of such measures.

The aim of providing similar water quality objectives in relation to groundwater has been expressed recently by the National Rivers Authorities through publication of a document outlining policy and practice for the protection of groundwater. The document expresses the principles of groundwater protection and gives details of a policy framework which involves subdividing the risk of contamination of groundwater on the basis of spatial criteria, by defining source protection zones around a groundwater source.

Effluent discharges from domestic premises are not controlled. In rural areas away from large conurbations some domestic properties are not connected to a main sewerage system, instead they rely on septic tanks or on the dispersive mechanics of soakaways.

Emissions to air from some public utilities, notably hospitals, will be subject to Local Authority Air Pollution Control (LAAPC) as referred to in Section 2. A few retail, and commercial sites are subject to LAAPC but not domestic sites. In most areas local authorities have designated smokeless zones, in which local inhabitants are required to use smokeless fuels for heat generation.

The recovery and handling of most solid waste and some liquid waste from retail, commercial and domestic sites is principally controlled by local authorities. General municipal waste will either go to licensed landfill sites or waste incinerators. Waste designated as 'special waste' as defined under The Control of Pollution (Special Waste) Regulations 1980 must be conveyed directly to waste disposal facilities licensed to handle the specific material. Separation and classification of special or recyclable waste at domestic level is of increasing importance and is actively encouraged. Kerbside collection schemes coupled with guidance on substances or products containing special or recyclable material will improve recycling rates. The Government has already indicated in the Second Year Report on the White Paper, its interest in using economic instruments as a further incentive towards meeting the stated target of recycling 25% of household waste by the year 2000. A consultants report examining this issue has recently been published.

It is clear from the earlier discussion of sources that a significant number of substances used in commercial, retail, domestic and public premises are ones that originate as a component of a product for which the characteristics of usage and disposal constitute a diffuse source. For most of these sources it may be impractical to control the release of substances at the point of emission and it is therefore more appropriate to control the supply and use of the products. In the UK, Section 140 of the Environmental Protection Act 1990 (EPA 90) provides powers to control the supply and use of specified substances. These controls may range from an outright ban on a particular substance, to limits on the amount supplied and areas of permitted usage. Within the European Community such controls on hazardous substances are set out in the Marketing and Use Directive (76/769/EEC) with further substance-specific measures included in amendments. Recent Marketing and Use Directives have seen restrictions placed on the supply and use of lead pigments in paint (8th Amendment: 89/677/EEC), the use of cadmium as a pigment for stabilising plastics and for plating metal (10th Amendment: 91/338/EEC), and further controls on asbestos (first adaptation to technical progress: 91/659/EEC). Apart from EPA90, these restrictions are also implemented in the UK under other legislation i.e. The European Communities Act (1972), The Consumer Protection Act (1987) or the Health and Safety at Work Act (1974).

When the usage of a hazardous substance is essential and a less hazardous alternative can not be identified, then the fate of such substances can be influenced by descriptive labelling and packaging of products containing them. This provides users with details of the hazardous properties of a substance and the most appropriate way to handle it, including correct disposal. The Chemicals (Hazard Information and Packaging) Regulations 1993 provides standard criteria for these activities ensuring a consistency of guidance and instruction to users across a range of products containing the same substance. The Regulations implement the Preparations Directive (88/379/EEC) and parts of the 7th amendment to the Dangerous Substances Directive (92/32/EEC).

The use of products and substances intended for domestic plumbing and public water supplies is controlled by section 25 of the Water Supply (Water Quality) Regulations 1989. Introduction of new products and substances now requires statutory approval from the Secretary of State based on advice from a statutory committee. Once products and substances are installed, there is a further level of control in that the water at the point of supply is monitored by water companies for compliance with prescribed concentrations. For supply equipment that was in place before the approvals system was established, releases of hazardous substances can be minimised by remedial measures. These include dosing of water with non-toxic substances to minimise the leaching of hazardous substances from pipework.

3. AGRICULTURAL, HORTICULTURAL, FORESTRY AND AQUACULTURAL OPERATIONS

3.1 SOURCES

A large part of the natural environment is used for the production of plant and animal foods, timber and other living materials. These activities largely determine the appearance and functioning of these parts of the environment. A significant number of substances used in such production are required to either sustain or enhance the fertility of soil (fertilisers) or to protect the plant or animal from disease and predation (pesticides and veterinary medicines). Although chemically formulated to perform a specific function, some substances, for instance fertilisers, may contain natural impurities which are often redundant in terms of enhancing soil fertility, but once applied to soils constitute a diffuse source. A notable example of this type of diffuse source is cadmium in fertilisers, which originates from the phosphatic rock used in fertiliser production.

In many cases a fertiliser or pesticide is required to pervade throughout the matter to which it is applied. This means that the substance is either applied in a dispersive manner or is designed to be mobile. Therefore, although in many cases the application of a pesticide or fertiliser may be controlled in terms of quantity and location, it may persist in the environment or within the plant or animal and subsequently become a diffuse source. Some chemicals may evaporate from surfaces after application, others may be leached from soils over time and migrate laterally into adjacent surface-water bodies or vertically into groundwater aquifers. Often the extent to which this occurs depends on local conditions such as prevailing winds or rainfall frequency. The length of time for which a substance persists in the environment in its present form depends on its chemical or biological degradability, and other factors such as the presence of heat, light, oxygen and other chemicals.

Extensive use of veterinary medicines is necessary to prevent disease in farmed animals, including fish, and to control internal and external parasites. Many of these medicines enter directly into the environment or via the excreta of treated animals. Residues of pesticides and veterinary medicines in plant and animal tissues are another route for diffuse releases to the environment. Because of their function these substances are biologically active and are potentially harmful to non-target organisms and as such are tightly controlled.

Well established practices in the cultivation of plants and animals often generate further emissions of chemicals. The burning of stubble and other crop residues has been recognised as a diffuse source of air emissions including some hazardous combustion products. Fish farmed in large tanks require the water to be frequently renewed, this often involves discharging large volumes of water into nearby surface-waters. Such water is not only depleted in oxygen relative to the receiving waters but may also contain veterinary medicines and other substances used in the rearing of fish.

3.2 CONTROLS

Pesticides are controlled under the Food and Environmental Protection Act 1985 (FEPA) and The Control of Pesticides Regulations 1986. These Regulations provide a system of approvals for the production and use of pesticides. Approvals are granted after consultation with the Advisory Committee on Pesticides (ACP) in which the risks to human health and the environment associated with usage of a particular pesticide are assessed. Varying degrees of approval for use of a pesticide may be granted and all will be associated with certain conditions on the supply and use of the substance. In addition guidance like the Code of Practice for the Safe Use of Pesticides on Farms and Holdings provides information on the minimisation of risk of potential hazards by way of advice on correct handling, storage and disposal of pesticides.

Although the use of fertilisers is still essential for the enhancement of soil fertility and subsequent crop yield, some questions are being asked about the presence and levels of certain chemical constituents of artificial fertilisers. Any statutory restrictions could be introduced in Great Britain in The Fertilisers Regulations 1991. These lay down standards for the composition and labelling of fertilisers. The regulations also cover the addition of secondary nutrients (calcium, magnesium and sulphur) and trace elements (such as boron, copper and zinc) to fertilisers. These controls, however, provide standards containing minimum and not maximum levels.

A significant number of pesticides and fertilisers will be subject to the Control of Substances Hazardous to Health (COSHH) regulations. COSHH requires employers (or the self-employed) to assess risks and control measures appropriate to the handling of the substance Control measures may be determined by any exposure levels which have been set, and may include substitution, engineering control, or personal protection.

General guidance or codes of good agricultural practice for the protection of air, water and soil form additional control measures by promoting responsible use of hazardous substances, and regard for potential environmental impacts. The use of straw burning appliances, animal carcase incineration, and maggot breeding are among processes prescribed for LAAPC control.

The amount of potentially hazardous substances used in feedingstuffs is limited under The Feeding Stuffs Regulations 1991. These limits are designed to prevent harm to the animals consuming the feedingstuffs and subsequent consumers of animal products.

Discharges of effluent into water courses and groundwater from any farming activity, including fish farming, is controlled by consents and charges authorised by the National Rivers Authority and the River Purification Authorities. However the consent conditions usually do not incorporate limits on the content of veterinary medicines and other biologically active chemicals commonly used in this context. Veterinary medicine products are assessed for safety, quality and efficacy, and potential risk to the environment to comply with criteria established under EC legislation and implemented in the UK through the Medicines Act 1968. The Veterinary Products Committee makes recommendations on the acceptability for approval.

Although the use of non-agricultural pesticides and herbicides is currently controlled under the Marketing and Use Directive (76/769/EEC) the UK recently requested the EC to propose a Directive, relating specifically to these substances. The intention of the "Biocides Directive" is to establish a community wide approval scheme similar to the one already operating in the UK under the Food and Environmental Protection Act 1985.

4. WASTE DISPOSAL OPERATIONS

4.1 SOURCES

The waste disposal operations referred to in this section are similar to industrial operations in terms of characterising point and diffuse sources. In particular sewage treatment plants and incinerators are readily identified as point sources and many inputs and outputs are regulated in the same manner. However, one significant difference that may undermine the efficient control of emissions is the fact that inputs to waste disposal operations are not always easily regulated in terms of magnitude and frequency but more importantly in terms of composition. Therefore under these circumstances although emissions may originate from an identifiable point source, the composition of some discharges may not be fully resolved such that the release of unspecified substances will occur.

i) Landfill

Disposal to landfill is currently the primary method of disposing of solid waste but also acts as a disposal option for containerised liquid waste. Landfill operations have similar problems to sewage treatment plants in controlling inputs from diffuse sources, but unlike sewage works it is often the case that disposal to landfill is the final resting place for many chemicals and so further emissions are not contemplated. However despite being a potentially closed system diffuse releases may occur, either as dust or volatile emissions during the transport of waste or at the time of deposition at the landfill site, depending on the level of preventative measures taken and also the prevailing weather. After deposition substances may remain in a mobile state and as such can be leached from the site into surrounding areas including surface and groundwater. Decomposition of organic matter on site may also lead to significant gaseous emissions containing volatilised substances.

ii) Sewage Treatment

A sewage treatment plant is commonly the collection and treatment point for most liquid based wastes, although not exclusively, especially in the case of large volumes of concentrated liquid hazardous waste which is either sent for high temperature incineration or stored at special landfill sites. Inputs to the sewage system from many industrial point sources and some commercial premises are monitored but the numerous diffuse source inputs from private houses, and small businesses are not, because their large number and small individual size render it impractical. However for some substances the cumulative effect of these latter sources generates significant inputs to the treatment works. In some areas where the sewer system is old and in disrepair some liquid effluent may not arrive at the treatment plant. In addition some untreated sewage is also discharged to surface waters.

During the process of sewage treatment fugitive releases of substances may occur by evaporation, volatilisation and even dust emissions from sewage ponds. After processing, the problem of final disposal of solid and liquid effluent remains. Some substances may have been extracted and will be disposed of at special landfill sites. Other non-recoverable substances will remain in either the liquid effluent or the sludge waste. Most liquid effluent will be discharged to surface waters or the sea, whilst sludge waste is disposed of either on site or off site at landfills or spread on agricultural land or disposed of at specified sites in marine waters.

iii) Incineration

Most forms of waste can be sent for incineration. Special wastes often of specific composition but occurring in liquid or solid form are commonly sent to industrial high temperature incinerators. Other wastes of less easily defined composition including sewage sludge can be sent to other commercial or municipal incinerators. Most emissions would recognisably be classed as point source but here again the inability to determine fully the composition of inputs requires stringent control of outputs. Diffuse vapour and dust emissions from cooling fly ash are a further potential source of releases along with the eventual disposal of this material.

iv) Disposal at Sea

Coal mining waste, sewage sludge and dredged material are all waste products for which disposal offshore at marine dumping grounds is currently an option. Subsequent dispersion of deposited material from offshore dumping sites is a further source of emissions. Both physical and chemical dispersion can occur and is perhaps most acute during the dumping process. Marine currents and tidal mechanisms encourage the physical movement of material, the finer particles are transported the furthest. Exchanges between substances in the marine water and in the sediment can lead to increased concentration of dissolution products of substances in the surrounding waters, which are then dispersed more widely.

4.2 CONTROLS

Waste management controls have already been referred to in previous sections. The numerous controls cover the safe handling and transport of waste as well as guidance towards its eventual disposal. Wastes containing hazardous substances will be categorised as controlled wastes and as such will be subject to the duty of care provisions under Section 34 of the Environmental Protection Act 1990 (EPA 90), requiring the waste to be handled by authorised personnel at all stages ensuring that the waste is disposed of in a safe and responsible manner. Landfill sites are licensed by local authorities under the Control of Pollution Act 1974 and operators are required to meet specified conditions for the disposal of various wastes and the maintenance of sites to prevent environmental contamination off-site. These Regulations will be replaced by controls under EPA 90 starting from 1 May 1994.

Certain wastes may be classified as 'special waste' primarily because of the nature and concentration of various hazardous substances which may be present in the waste. Special waste will be subject to the requirements of the Control of Pollution (Special Waste) Regulations 1980 which in principal are an extension of the requirements for controlled waste. Guidance on the definition of special wastes and handling requirements is provided in Waste Management Paper No. 23.

Although controls on the operation of landfill sites exist in some detail today, some current sites and more especially past or completed landfill sites, may remain a threat to nearby surface water and groundwater as a result of pollution from leachate. The Royal Commission on Environmental Pollution's study into freshwater quality recently indicated that 45% of landfill sites were located in areas of highly permeable strata and only 15% of those located above aquifers were lined.

Wastewater discharges from sewage treatment works are controlled by consents from the National Rivers Authority and the River Purification Authorities. The treatment of sewage has not been designated a prescribed process and therefore it is not controlled by all the measures within IPC. There are a number of options for the disposal of solid waste recovered by sewage treatment. The disposal of sewage sludge at sea is an option that is set to diminish over the coming years as the target date for a ban on the dumping of waste at sea is reached. The elimination of this disposal option has already lead to an increase in disposal of sewage sludge on land. The potential environmental impact of this option is well recognised and is continuously assessed. Disposal of sludge to agricultural land is controlled under The Sludge (Use in Agriculture) Regulations 1989, and the amendment of 1990. A Code of Practice for Agricultural Use of Sewage Sludge provides supporting guidance. Sludge disposed of to landfill or used in the reclamation of derelict land is designated a controlled waste and is controlled by local authorities. Sludge disposed of within the curtilage of the sewage treatment works is not a controlled waste. Incineration of sewage sludge is designated a prescribed process and control measures accord with those for incinerators as outlined below.

The incineration of waste is subject to authorisation under the Integrated Pollution Control System and the Local Authority Air Pollution Control System depending on the size of plant and the type of waste being incinerated. Authorisations include establishing operating conditions compliant with BATNEEC and appropriate emission limits. A number of these control measures implement EC agreed emission limits.

The disposal of waste at sea is being phased out, although there are differing target dates for various wastes i.e end of 1998 for sewage sludge and end of 1992 for solid industrial waste. The disposal of solid and liquid coal mining waste in coastal/marine areas is licensed by the Ministry of Agriculture, Fisheries and Food under the Food and Environment Protection Act 1985. Restrictions are placed on the concentrations and total quantities of persistent, harmful substances that are permitted to be present in wastes for which disposal at sea licences are granted. These licences must now be renewed on an annual basis instead of the previously held five year interval. The pipeline discharge of liquid colliery tailings is carried out under consents given by the NRA. In concert with the general time phased ban on dumping of waste at sea it was announced in 1990 that no further MAFF licences would be given beyond 1995 unless it has been shown that no practical landbased method of disposal exists.

5. CONTAMINATED LAND AND EXTRACTION OF NATURAL RESOURCES

5.1 SOURCES

Contaminated land has been defined by the NATO Committee on Challenges to Modern Society as "land that contains substances which when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, to the environment, or on occasion to other targets". Sources of contamination include a wide range of industrial processes and waste disposal practices, both current and historic, which use or give rise to substances which may be harmful to man and the environment. Estimates of the amount of contaminated land in England and Wales vary widely. One estimate suggested that 50,000-100,000 sites may be considered to be contaminated.

As a result of the wide range of contaminative uses of land and the current virtually unpredictable number of occurrences such sites should generically be classified as diffuse sources. Depending on the nature of the chemical contaminant, the type of emissions likely to arise from these sources is equally variable and can range from leachate emissions into surface waters and groundwater, to particulate and gaseous emissions to air. Preventative and remedial measures can be taken to deal with contamination but these may lead to enhanced emissions in the short term and require careful control and monitoring. Remediated sites may need to be monitored to check for emissions in the longer term.

The extraction of mineral and coal, results in the exposure of large amounts of waste material comprising naturally occurring substances. In their natural state many of these wastes are of low bioavailability and relatively inert. However at some sites, for instance those areas associated with mining for metal ores (e.g. zinc, lead, copper, tin) exposed waste materials containing trace metals (e.g. slate tailings, muds) may be altered by physical, chemical and biological reaction into a more mobile substance which may present a greater risk of harm to man and the environment. Dispersion and dilution of these substances by air and water may reduce this risk. However accumulation of these substances elsewhere in the environment (e.g. estuaries, agricultural land) may lead to further increases in risk of harm. Disused and abandoned mines are a notable source of continued dispersion of hazardous substances in the absence of action to control natural drainage and erosion.

Activities at sites of oil and gas extraction both onshore and offshore can also lead to emissions of hazardous substances. Drilling muds and other substances introduced to these sites for the purposes of exploration and extraction contain substances which are released into the atmosphere or the marine environment during and after use. Recent attention has turned to the content of toxic metals in drilling muds and the release of zinc by sacrificial anodes used in the offshore areas to prevent corrosion of structures.

5.2 CONTROLS

The Environmental Protection Act 1990 (EPA 90) contains a number of powers which control contaminative uses of land. In particular, controls on the handling and disposal of waste and the maintenance of landfill sites, are concerned for the prevention of pollution from contaminative uses of land. Under Section 161 of the Water Resources Act 1991 the NRA is empowered to carry out any necessary works or operation to prevent or remedy any poisonous, noxious or polluting matter or any solid waste matter from entering controlled waters. These powers enable the NRA to act to prevent discharges to water bodies from contaminated land for the protection of water quality. Planning regulations, such as the Town and Country Planning Act 1990 also contain powers to prevent contaminative uses of land. In addition to legislation various guidance documents are available which provide information on the hazards and problems of assessment and redevelopment of contaminated land and action to protect land in the operation of potentially contaminative uses.

Some of the legislation cited above which relates to contaminated land is also used with regard to sites of extraction of natural resources. The Town and Country Planning Act 1990 contains powers to control the siting and operation of minerals extraction operations whilst the NRA controls discharges from operational mining sites using powers contained in the Water Resources Act 1991. Similar powers exist to prosecute owners of abandoned mines who cause water pollution. However, current legislation provides a defence against prosecution if the discharge has been permitted (rather than caused) to flow. It is moreover, often difficult to establish and enforce liability for pollution from abandoned mines. Identifying current ownership of these mines and establishing financial provision for preventative action is not always achievable before further damage to the environment occurs.

The use of potentially hazardous substances in the offshore oil and gas sector is regulated by the Department of Trade and Industry who administer the notification scheme for the selection of chemicals for use offshore. This scheme promotes avoidance of the use of particularly hazardous chemicals and where the use is justified certain information on the scale of use of the substance and its physico-chemical properties and marine toxicology are required to be submitted to the Department. Using this information the substance is categorised and this provides a basis for determining the extent of further controls on discharges.

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6. TRANSPORT AND INFRASTRUCTURE

6.1 SOURCES

The number, spatial distribution and inherent mobility or diffusivity of transport vehicles typifies a diffuse source. Transport vehicles however should include all forms of road vehicles, trains, aircraft, barges and ships which are similarly regarded as diffuse sources.

Exhaust emissions from combustion engines are probably the most visible type of release of substances from transport vehicles. These emissions include gases, aerosols and particulates, which are common combustion products notably from petrol or diesel powered engines but also from propane gas engines. The composition of the fuel is the primary determinant of the composition of the exhaust emission although other engine fluids and products of engine wear will also emerge from the exhaust. Fugitive emissions of un-burnt fuel may also occur due to leakages from the vehicle or releases during the process of refuelling.

Lubricants, protective greases, coolants and antifreezes are all chemical substances common to motorised vehicles and as such are likely to be emitted at irregular intervals during the life-time of the vehicle. Wear and tear of tyres and brake linings leads to dust emissions from land based vehicles and aircraft. Unavoidable degradation of the general fabric of all types of vehicles of transport can lead to other more variable emissions.

The use of substances such as salt, urea, glycol and other compounds for de-icing vehicles or roads and runways is also a significant transport related source of releases as is the use of antifoulants on water-borne vessels. These substances are designed to be used in a dispersive manner.

Infrastructure is fixed structures such as roads, railways, bridges, service areas, maintenance sites etc. Emissions will occur throughout the life-time of the component of infrastructure covering construction, degradation and demolition. Substances may be released from materials incorporated in the basic fabric of the structure but also from materials used to preserve and maintain the infrastructure which include cleaning fluids, greases and pesticides. The process of construction itself can temporarily increase the amount of emissions from the emergent infrastructure. Dusts, liquid effluent and other waste materials which are generated at the construction site may be disposed of on site, removed to other waste disposal units or dispersed in the local environment. The subsequent degradation of infrastructure in conjunction with the natural agents of wind, rain and temperature change and the man-made agents such as acid rain and other atmospheric pollutants encourage further diffuse emissions over time. Examples of emissions include corrosion products from metallic materials such as girders, lead flashing, and communication pipes for utilities and the erosion of concrete and cement mortars. Materials such as cement and steel girders will release substances which are present as essential constituents as well as impurities.

6.2 CONTROLS

The Government has introduced regulations to reduce statutory limits on the lead content of petrol (Motor Vehicles (lead content of petrol) (amendments) Regulations 1989), whilst also creating economic measures to encourage the use of lead-free petrol. The requirement for all new cars sold in the UK after the end of 1992 to be fitted with catalytic converters (Consolidated Cars Directive 91/441/EEC) will also result in a continued reduction in usage of leaded petrol. This requirement has also enabled tighter limit values to be set on emissions of hydrocarbons, carbon monoxide and nitrogen oxide, leading to a reduction in emissions of these substances by at least 80% from each new vehicle.

Apart from meeting the same limits for gaseous emissions, diesel cars and light vans will need to comply for the first time with a strict limit on particulates (smoke). The European Community has also agreed new, tighter diesel standards for buses and lorries over 3.5 tonnes (HGV Directive 91/542/EEC). These will mean that, by October 1996, all newly registered heavy diesel vehicles will have to meet a standard for emissions of oxides of nitrogen, which will be less than half its present value. The new standards also introduce a limit on particulates. Low sulphur diesel fuel (0.05%

volume) will be required in order to meet the prescribed particulate limits and should be available by 1996, amending EC Directive 87/219/EEC on sulphur content of certain liquid fuels.

The implementation of these requirements for in-service cars will be encouraged by the adoption of statutory exhaust emission limits which are enforceable by vehicle inspection during roadside spot checks and as part of the annual test of roadworthiness prescribed by the Department of Transport. These checks are designed to encourage motorists to keep their engines in tune, resulting in less fuel burnt and fewer emissions of pollutants. It is expected to generate a 4% reduction on carbon dioxide emissions averaged over the sixteen and a half million cars and light vans in the MOT scheme, with substantially larger benefits to carbon monoxide and hydrocarbon emissions.

Controls on the use of hazardous substances in the manufacture of vehicles include recent measures to limit emissions of volatile organic compounds during paint spraying operations and legislative controls on substances used in the formulation of vehicle components. A recent amendment of the Marketing and Use Directive 76/769 (10th Amendment: 91/338/EEC) bans the use of cadmium in many components used in vehicle manufacturing excluding essential uses in connection with safety requirements. These controls extend to other motorised road transport vehicles, agricultural vehicles, rolling stock and waterborne vessels.

The Control of Pollution (Anti-Fouling Paints and Treatments) Regulations 1987 introduced by the Government under the Control of Pollution Act 1974 has restricted the supply and use of certain types of antifoulant paints used mainly in the protection of hulls of waterborne vessels.

Releases of hazardous substances from many elements of infrastructure are either controlled through regulations restricting the supply and use of specific materials used in the basic fabric of infrastructure or through regulations designed to control or limit the impact of infrastructure on the surrounding environment by way of planning regulations. The availability of herbicides, which are included in the definition of pesticides for weed control around elements of infrastructure is governed by approvals system established under the Food and Environmental Protection Act 1985. Guidance for the control of weeds on non-agricultural land through the use of herbicides has recently been issued by the Department of the Environment to encourage safe use and minimise unnecessary releases of these substances.

7. NATURAL SOURCES

A wide variety of substances which are defined as contaminants also occur naturally. These include potentially harmful metallic elements, liberated during weathering of rocks and ore-bodies and sometimes concentrated in sediments and soils, and gases such as methane and radon which are emitted from certain types of rocks. The extent to which these may present a potential hazard depends on the concentrations which occur and the chemical forms of the substances, some of which are more readily taken up by organisms. Human activity may encourage concentration of contaminants or promote their redistribution, for example during mining operations.

Since anthropogenic contaminants will be superimposed on these natural "background" levels, data on these levels are essential for any estimation of current inputs of pollutants encouraged by Man, and assessment of the practicability and utility of control measures. The measurement of background levels commonly includes pre-industrial revolution anthropogenic inputs such as those derived from metalliferous mining on the basis of a present inability to discriminate between these and naturally dispersed substances. However it is usually easier to distinguish contamination which is the result of industrial processes. The identification of high levels of natural contaminants does not necessarily indicate that there is a problem since other factors including land use and management need to be considered.

The Department of the Environment has commissioned a review of natural contamination in Great Britain. This will draw together existing information on background levels of selected substances in order to outline broad areas within which these will need to be taken into consideration during specific site assessments. The results of the work will also provide a basis for assessing areas where current or future anthropogenic inputs might exacerbate levels which are already high.

Radon gas is a recognised source of naturally occurring radiation and as such is not covered by this consultation paper.

ANNEX II

THE MONTREAL PROTOCOL

The Montreal Protocol is the international agreement to control the production and consumption of ozone depleting substances. At present, there are over 120 signatories. The Protocol came into force on 1 January 1989. It covered two groups of chemicals - CFCs and halons. From 1989 each Party was required to freeze its production and consumption (defined as production + imports - exports) of CFCs at 1986 levels, reduce them by 20% from 1993 and by 50% from 1998. For halons, each Party was required to restrict production and consumption to 1986 levels from 1992. The controls are weighted according to ozone depletion potential (ODP) - thus a signatory cannot produce or consume more than a given base total ODP of CFCs but within that limit can consume more or less of a given CFC.

Since then, Meetings of the Parties to the Montreal Protocol have been held in Helsinki London, Copenhagen and Bangkok. Controls on carbon tetrachloride, 1,1,1 trichloroethane, HBFCs, HCFCs and methyl bromide have also been agreed. The Protocol calls for total phase out of production and consumption of halons by 1 January 1994, CFCs, carbon tetrachloride, 1,1,1 trichloroethane and HBFCs by 1 January 1996. In addition, it has been agreed to freeze production and consumption of methyl bromide at 1991 levels by 1996. A cap on consumption of HCFCs based on 3.1% of CFC consumption in 1989 and total HCFC consumption in 1989 will be introduced in 1996 and a gradual reduction is planned to final phaseout in 2030.

Developing countries are allowed a ten year "period of grace" before they have to start following phase out schedules. A mechanism to provide financial and technical cooperation, including technology transfer, to developing country Parties has been set up.

The Protocol is enforced in the European Community through Regulations. EC Regulation controls CFCs, halons, carbon tetrachloride and 1,1,1 trichloroethane and has shorter phase out schedules for CFCs and carbon tetrachloride. These will be phased out by 1 January 1995 with an 85% reduction by 1994. Political agreement has also been reached on an EC Regulation to control HCFCs, HBFCs, and methyl bromide. This introduces a cap of 2.6% of HCFC consumption from 1995 and brings the final phaseout forward to 2015. In addition a 25% cut in production and consumption of methyl bromide by 1 January 1998 has been agreed.

ANNEX III

THE OSLO AND PARIS CONVENTIONS

The Oslo Convention for the prevention of marine pollution from ships and aircraft entered into force in 1974. Initially the Oslo Commission set out to control the dumping of liquid industrial wastes, sewage sludge and dredged material and its coverage was extended to control incineration at sea of liquid industrial wastes. In 1989 the Oslo Commission agreed that disposal at sea of all hazardous industrial waste should cease in the whole of the Convention area by the end of 1995. Incineration at sea will terminate in 1994.

The Paris Convention for the prevention of marine pollution from land-based sources entered into force in 1978. The purpose of this Convention is to control all discharges into the sea from land-based sources including rivers, oil platforms, the atmosphere or directly from the surrounding coasts. The Paris Commission controls discharges into the sea by agreeing programmes and measures to eliminate, reduce or prevent the input of pollutants into rivers or directly into the sea. The Commission, in recent years, has adopted a number of measures to reduce inputs of certain noxious substances, such as to limit emissions of mercury, cadmium and oil from various sources. The Convention has been amended to include atmospheric emissions which affect the maritime area.

The Oslo and Paris Commissions maintain links with other international organisations concerned with aspects of marine pollution including the London Convention 1972 which deals with marine dumping issues worldwide. In addition, following the Second North Sea Conference held in London in 1987, the Commissions established, jointly with the International Council for the Exploration of the Sea, the North Sea Task Force as a means of enhancing scientific knowledge and the understanding of the North Sea environment.

After nearly 20 years in operation, both the Oslo and Paris Commissions have been reviewed because considerable advances have been made since the 1970's in combatting marine pollution. The review concluded that the two Conventions should be merged and updated into a revised Convention.

In September 1992, Ministers signed a new Convention for the Protection of the Marine Environment for the North East Atlantic. The new Convention emphasises the application of the Precautionary Principle, the Polluter Pays Principle and the use of Best Available Techniques and Best Environmental Practice, including clean technology. Ministers also made a declaration which made a number of commitments to improve the marine environment. One of the main objectives of this was in principle, reducing by the year 2000 emissions and discharges of substances that result from human activity and which combine the properties of being toxic, persistent and liable to accumulate in the food chain to levels that are harmful. This new convention will replace the existing Oslo and Paris Conventions when all the Contracting Parties have ratified it.

LIST OF PARIS COMMISSION (PARCOM) "DECISIONS" 1978 - 1992

1978 Decision upon a line of action for a dual approach to reducing mercury discharges (EQO and UES approaches) (valid for a period of five years).

1980 Decision on limit values for mercury emissions in water from existing and new brine recirculation chlor-alkali plants (exit of the purification plant).

Decision on environmental quality standard for mercury in organisms.

1981 Decision on the notification of chemicals used offshore.

Decision on limit values for existing waste brine chlor-alkali plants.

Decision on limit values for existing brine recirculation chlor-alkali plants (exit of the factory site).

1982 Decision on new chlor-alkali plants using mercury cells.

1984 Decision on the use of oil based muds

1985 Decision to ask France to convene a Diplomatic Conference for the purpose of amending the Convention by extending its scope to include pollution of the maritime area through the atmosphere.

Decision to phase out the use of aldrin, dieldrin and endrin.

PARCOM Decision 85/1: Programmes and Measures of 31 December 1985 on Limit Values and Quality Objectives for Mercury Discharges by Sectors other than the Chlor-alkali Industry.

PARCOM Decision 85/2: Programmes and Measures of 31 December 1985 on Limit Values and Quality Objectives for Cadmium Discharges.

1986 PARCOM Decision 86/1 of 4 June 1986 on discharges resulting from exploration activities.

PARCOM Decision 86/2 of 4 June 1986 on the use of oil based muds.

1988 PARCOM Decision 88/1 of 17 June 1988 on the use of oil based muds.

1990 PARCOM Decision 90/1 of 14 June 1990 on the reduction of discharges of chlorinated organic substances from the production of bleached kraft pulp and sulphite pulp.

PARCOM Decision 90/2 of 14 June 1990 on programme and measures for mercury and cadmium containing batteries.

PARCOM Decision 90/3 of 14 June 1990 on reducing atmospheric emissions from existing chlor-alkali plants.

PARCOM Decision 90/4 of 14 June 1990 on phasing out of PCBs.

1992 PARCOM Decision 92/1 of 22 September 1992 on the reduction of discharges of chlorinated organic substances from the production of bleached kraft pulp and sulphite pulp.

PARCOM Decision 92/2 of 22 September 1992 on oil based muds.

PARCOM Decision 92/4 of 22 September 1992 on the phasing out of the use of Hexachloroethane (HCE) in the secondary aluminium industry and in the primary aluminium industry with integrated foundries.

1993 PARCOM Decision 93/1 of 19 June 1993 on the phasing out of the use of Hexachloroethane (HCE) in the non-ferrous metal industry.

ANNEX IV

INTEGRATED POLLUTION CONTROL

Part I of the Environmental Protection Act 1990 (EPA90) establishes two separate pollution control regimes: Integrated Pollution Control (IPC) and the Local Authority Air Pollution Control (LAAPC). IPC is to be operated by HM Inspectorate of Pollution (HMIP) in England and Wales and in Scotland, HM Industrial Pollution Inspectorate (HMIPI) and the River Purification Authorities (RPAs) acting jointly.

The main objectives of IPC are:

- to prevent or minimise the release of prescribed substances and to render harmless any such substances which are released;
- to develop an approach to pollution control that considers discharges from industrial processes to all media in the context of the effect on the environment as a whole.

Under Part I of EPA90 prescribed processes and substances require authorisation.

The processes and substances prescribed are set out in the Environmental Protection (Prescribed Processes and Substances) Regulations 1991 and subsequent amendments. Processes are prescribed either for control under IPC (Part A Processes) or LAAPC (Part B Processes).

In the case of Part A processes, IPC control embraces releases to all media (air, water and land). The only exception to this is where disposal is to a waste disposal facility licensed by a Waste Regulation Authority, where that Authority retains control of the ultimate disposal. Additionally where effluent is disposed of to a public sewer, it is necessary for the plant operator to obtain a consent from the relevant sewerage undertaker to this method of disposal in addition to that contained in the IPC authorisation.

Part B processes fall to be controlled by local authorities. However, their remit extends only to the control of releases to air. Any other releases (i.e. to water or land) are controlled by the relevant body (e.g. National Rivers Authority).

In order to obtain an authorisation, it is necessary for the plant operator to demonstrate to the satisfaction of the authorising body that he will be employing the best available techniques not entailing excessive cost (BATNEEC) to prevent, minimise, or render harmless all releases of prescribed substances and to render harmless all other releases from the plant.

IPC and LAAPC are being introduced progressively having begun on 1st April 1991 in England and Wales and 1 April 1992 in Scotland. Under transitional arrangements, existing processes may continue to operate prior to receiving (or being refused) an authorisation. Authorities can issue enforcement, variation, prohibition and revocation notices to ensure that appropriate standards of control are met, and raised in line with new techniques and new awareness of environmental risk.

Advice on what constitutes BATNEEC is contained in Chief Inspector Guidance Notes to his Inspectors issued by HMIP for Part A processes and Secretary of State's Guidance Notes issued by DOE, WO, SO for Part B processes. In both cases, Notes contain advice not only on the control of point source releases, but also the prevention or control of diffuse source releases, particularly those of a fugitive nature.

Public registers must be set up by each local authority giving details of all IPC and LAAPC processes in its area. HMIP, HMIPI and the RPA's also maintain public registers of all IPC processes. These must include specified particulars of applications, authorisations, notices, directions issued by the Secretary of State, appeal decisions, monitoring data etc.

The following is a list of Prescribed Processes and Prescribed Substances (for detailed clarification consult SI 1991/472 as amended);

PRESCRIBED PROCESSES

The Production of Fuel and Power and Associated Processes

Gasification and Associated Processes
Carbonisation and Associated Processes
Combustion Processes
Petroleum Processes

Metal Production and Processing

Iron and Steel
Non-ferrous Metals
Smelting Processes

Mineral Industries

Cement and Lime Manufacture and Associated Processes
Processes Involving Asbestos
Other Mineral Fibres
Other Mineral Processes
Glass Manufacture and Production
Ceramic Production

The Chemical Industry

Petrochemical Processes
The Manufacture and Use of Organic Chemicals
Acid Processes
Processes Involving Halogens
Inorganic Chemical Processes
Chemical Fertiliser Production
Pesticide Production
Pharmaceutical Production
The Storage of Chemicals in Bulk

Waste Disposal and Recycling

Incineration
Recovery Processes
The Production of Fuel From Waste

Other Industries

Paper and Pulp Manufacturing Processes
Di-isocyanate Processes
Tar and Bitumen Processes
Processes Involving Uranium
Coating Processes and Printing
The Manufacture of Dyestuffs, Printing Ink and Coating Materials
Timber Processes
Processes Involving Rubber
The Treatment and Processes of Animal or Vegetable Matter

RELEASE INTO THE AIR : PRESCRIBED SUBSTANCES

Oxides of sulphur and other sulphur compounds
Oxides of nitrogen and other nitrogen compounds
Oxides of carbon
Organic compounds and partial oxidation products
Metals, metalloids and their compounds
Asbestos (suspended particulate matter and fibres), glass fibres and mineral fibres
Halogens and their compounds
Phosphorus and its compounds
Particulate matter

RELEASE INTO WATER : PRESCRIBED SUBSTANCES

Mercury and its compounds
Cadmium and its compounds
All isomers of hexachlorocyclohexane
All isomers of DDT
Pentachlorophenol and its compounds
Hexachlorobenzene
Hexachlorobutadiene
Aldrin
Dieldrin
Endrin
Polychlorinated Biphenyls
Dichlorvos
1,2-Dichloroethane
All isomers of trichlorobenzene
Atrazine
Simazine
Tributylin compounds
Triphenyltin compounds
Trifluralin
Fenitrothion
Azinphos-methyl
Malathion
Endosulfan

RELEASE TO LAND : PRESCRIBED SUBSTANCES

Organic solvents
Azides
Halogens and their covalent compounds
Metal carbonyls
Organo-metallic compounds
Oxidising agents
Polychlorinated dibenzofuran and any congener thereof
Polychlorinated dibenzo-p-dioxin and any congener thereof
Polyhalogenated biphenyls, terphenyls and napthalenes
Phosphorus

Pesticides, that is to say, any chemical substance or preparation prepared or used for destroying any pest, including those used for protecting plants or wood or other plant products from harmful organisms; regulating the growth of plants; giving protection against harmful creatures; rendering such creature harmless; controlling organisms with harmful or unwanted effects on water systems, buildings or other structures, or on manufactured products;or protecting animals against ectoparasites.

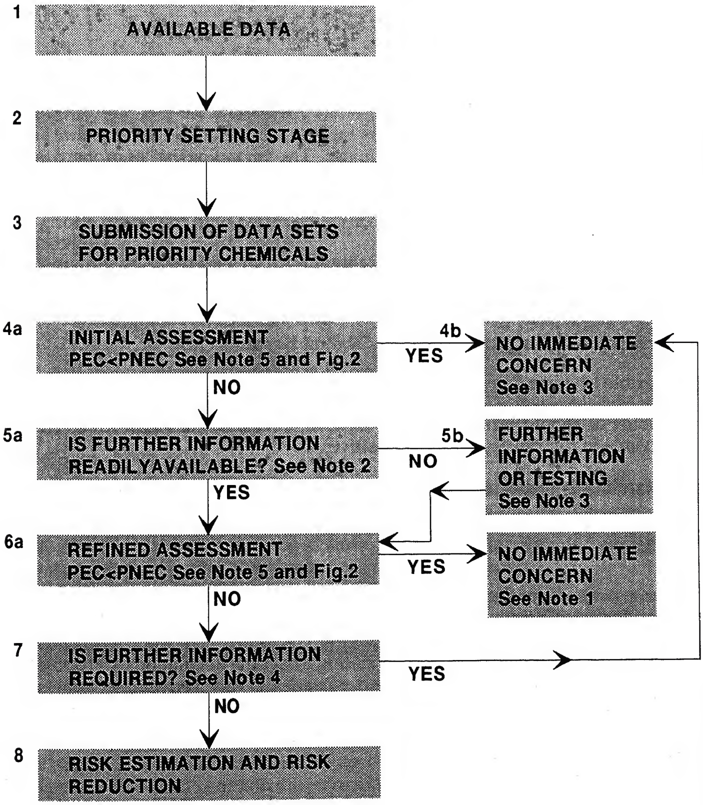
Alkali metals and their oxides and alkaline earth metals and their oxides.

ANNEX V

PRIORITY SETTING AND RISK CHARACTERISATION

The following figures summarise the guidelines for the environmental assessment of existing substances developed by a UK Government-Industry Working Group. A similar scheme has been developed for the human health assessment. In both cases the first step involves the collection and notification of available data on a given substance by the manufacturer or importer, followed by a prioritisation step for further assessment.

FIGURE 1: OVERALL FRAMEWORK FOR ENVIRONMENTAL RISK ASSESSMENT


1
AVAILABLE DATA
2
PRIORITY SETTING STAGE
3
SUBMISSION OF DATA SETS FOR PRIORITY CHEMICALS
4a
INITIAL ASSESSMENT PEC<PNEC See Note 5 and Fig.2
4b
YES
NO IMMEDIATE CONCERN See Note 3
NO
5a
IS FURTHER INFORMATION READILYAVAILABLE? See Note 2
5b
NO
FURTHER INFORMATION OR TESTING See Note 3
YES
6a
REFINED ASSESSMENT PEC<PNEC See Note 5 and Fig.2
YES
NO IMMEDIATE CONCERN See Note 1
NO
7
IS FURTHER INFORMATION REQUIRED? See Note 4
YES
NO
8
RISK ESTIMATION AND RISK REDUCTION

Notes for figure 1

1. Further information on substances within this box, eg increased production, change of use, regulatory action elsewhere, problems with related compounds etc, should lead to re-introduction into the scheme at box 5a.
2. Any information relevant to the assessment may be included here, including SAR or analog data, site specific data, measured environmental levels, effects from field studies, exposure or modelling data etc. If no further information is available proceed to box 5b.
3. Further information on exposure and the pattern of exposure, and/or the need for further testing should be related to improving the assessment.
4. When box 7 is reached the assessor may ask for further information on the substance or may decide to propose risk estimation and risk reduction steps. At this stage, the notifier should be given the opportunity to submit relevant additional information.
5. As well as PEC/PNEC comparison, which is concerned mainly with aquatic effects, direct toxic effects in other compartments and indirect effects (eg food chain effects and atmospheric effects) should also be considered.

Priority Setting

Priority lists compiled under the EC Regulation (No. 793/93) on the evaluation and control of the risks of existing substances are not priorities for control, rather they are priorities for fuller evaluation. It is likely that most chemicals on the lists will be found not to require severe control measures after they have been properly evaluated. The "shopping list" of properties required for the scheme are as follows:

- quick (large numbers of chemicals must be sorted with minimum effort),
- capable of computerisation (preferably linking in with the Commission database),
- transparent (its processes should be clear to users),
- systematic (the allocation of scores should be consistent),
- flexible (the size and quality of available data sets will vary considerably),
- robust (it should produce neither false negatives, where a hazardous chemical is not given a high priority, nor false positive),
- scientifically justified,
- resolving power (the output should differentiate between chemicals sufficiently to allow priority lists to be made).

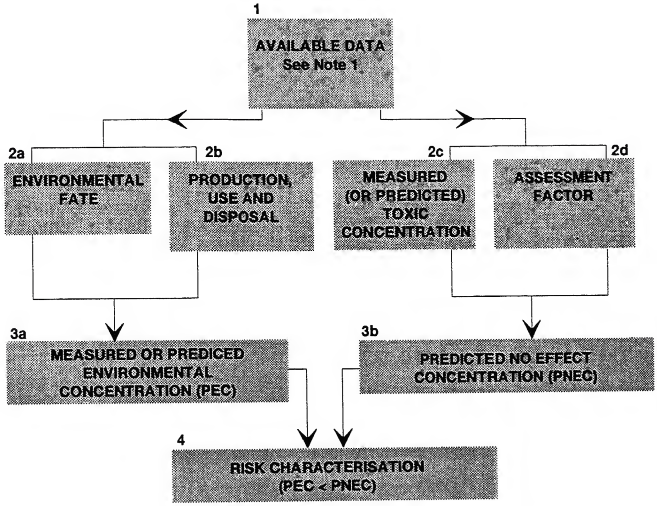
Many of these aims are conflicting and a balance must be struck between them. To this end, a UK Government-Industry Working Group have developed a scheme to set priorities for both environmental and human health assessment of existing chemicals. This work has contributed to the development of an EC proposal for priority setting under the Regulation (A Proposal for Priority Setting of Existing Chemical Substances, van der Zandt and van Leeuwen, September 1992, report prepared for DG XI of the Commission of the European Communities).

Both schemes consist of two parts, one for human health and the other for the environment, each of which is based on simple numerical scoring systems. Scores allocated to effects and exposure data are then combined to give totals for human health and the environment which can then be ordered to give two priority lists of continuously graded chemicals.

Risk Characterisation

Risk characterisation is defined as the estimation of the incidence and severity of the adverse effects likely to occur in a human population or environmental compartment due to actual or predicted exposure to a substances. The guidance developed for environmental risk characterisation by the UK Government-Industry Working Group is summarised in Figure 2. Guidance has also been developed for human health.

FIGURE 2: ENVIRONMENTAL RISK CHARACTERISATION FOR EXISTING CHEMICALS - Expansion of Figure 1, Boxes 4a and 6a


1
AVAILABLE DATA See Note 1
2a
ENVIRONMENTAL FATE
2b
PRODUCTION, USE AND DISPOSAL
2c
MEASURED (OR PREDICTED) TOXIC CONCENTRATION
2d
ASSESSMENT FACTOR
3a
MEASURED OR PREDICED ENVIRONMENTAL CONCENTRATION (PEC)
3b
PREDICTED NO EFFECT CONCENTRATION (PNEC)
4
RISK CHARACTERISATION (PEC < PNEC)

Notes for figure 2

1. Data as required by EC 6/7 Amendment to the Dangerous Substances Directive (67/548/EEC) or other measured/predicted data.

2a. Fate data should include environmental distribution, bioaccumulation, bioavailability, degradation pathways and/or final resting place, eg sediments or soils.

2b. Use pattern data: number of sites; dispersed or restricted use; wastage rates in use; measured concentrations; physical form; volume of material in each use, etc.

2c. Toxic concentration from laboratory test result, SAR (structure activity relationship) or from field data.

2d. The assessment factor depends on the amount and relevance of the available data (ie toxic effect of concern/ecosystem of concern).

3a. Predicted concentration in various media, particularly water, soil, sediment and the food chain, supported with measured values where possible.

3b. This is the experimentally determined or predicted toxicity data divided by the appropriate assessment factor.

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